REMARKS

Claims 1-5 have been canceled and claims 26-30 have been added. Accordingly, claims 6-30 are currently pending in the case. Further examination and reconsideration of the presently claimed application are respectfully requested.

Objections to the Claims

Claims 9-11, 13-15, 18, 20, 21, and 23-25 were objected to as being dependent upon rejected base claims. Applicant sincerely appreciates the Examiner's recognition of the patentable subject matter recited in these claims. However, as will be set forth below, independent claims 6, 12, and 19 are patentably distinct from the cited art. Therefore, dependent claims 9-11, 13-15, 18, 20, 21, and 23-25 are also patentable over the cited art. Accordingly, Applicants respectfully request removal of this objection.

Section 103 Rejections

Claims 1-8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,040,233 to Hodges (hereinafter referred to as "Hodges") in view of U.S. Patent No. 5,104,819 to Freiberger et al. (hereinafter referred to as "Freiberger"), U.S. Patent No. 6,245,616 to Buchanan et al. (hereinafter referred to as "Buchanan"), and U.S. Patent No. 5,930,625 to Lin et al. (hereinafter referred to as "Lin"). In addition, claims 12, 16, 17, 19, and 22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,380,056 to Shue et al. (hereinafter referred to as "Shue") in view of U.S. Patent No. 5,304,398 to Krusell et al. (hereinafter referred to as "Krusell") and U.S. Patent No. 4,749,640 to Tremont et al. (hereinafter referred to as "Tremont"). Claims 1-5 have been canceled rendering rejection thereto moot. To establish a *prima facie* obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974), MPEP 2143.03. Obviousness cannot be established by combining or modifying the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion or incentive to do so. *In re Bond,* 910 F. 2d 81, 834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990). The cited art does not teach or suggest all limitations of the currently pending claims, some distinctive limitations of which are set forth in more detail below.

None of the cited art teaches or suggests a semiconductor device with an oxide-nitride gate dielectric having substantially similar gate to substrate capacitance as an oxide gate dielectric comprising a thickness less than approximately 20 angstroms. Claim 6 recites: "[a] semiconductor device comprising an oxide-nitride gate dielectric having substantially similar gate to substrate capacitance as an oxide gate dielectric comprising a thickness less than approximately 20 angstroms." As noted on page 3 of the Office Action, Hodges fails to disclose a device with the capacitance recited in claim 6. The Office Action, however, appears to cite Buchanan and Lin as disclosing structures with such a capacitance to substantiate an obviousness rejection in view of Hodges. It is asserted that neither Buchanan, Lin, nor any of the other cited art teaches the capacitance limitation of claim 6 and, therefore, the declarations made in the Office Action are traversed.

In particular, there is no teaching or suggestion within Buchanan detailing the capacitance of gate dielectric 20, especially in comparison to silicon dioxide gate dielectrics. Lin, on the other hand, does describe capacitor dielectric layer 13 with reference to equivalent silicon dioxide thicknesses. For example, Lin teaches capacitor dielectric layer 13 as a Ta_2O_5 layer having "... an equivalent silicon dioxide thickness between about 20 to 80 Angstroms." (Lin, column 5, lines 34-36). Such an equivalent thickness, however, is specifically in reference to a layer of tantalum pentoxide and not to an oxide-nitride layer as recited in claim 6. Lin also teaches capacitor dielectric layer 13 as an ONO or an NO layer, but only teaches an equivalent silicon dioxide thickness for the embodiment in which an ONO layer is employed. "Subsequent thermal oxidation of the silicon nitride layer results in the formation of a silicon oxynitride layer on silicon oxide, at a silicon oxide equivalent thickness of between about 30 to 80 Angstroms." (Lin, column 5, lines 42-46). Clearly, in such an embodiment, Lin does not teach capacitor layer 13 having an equivalent silicon oxide thickness less than 20 angstroms as recited in claim 6.

Even if the ONO layer disclosed within Lin or gate dielectric 20 disclosed in Buchanan were taught to have equivalent silicon oxide thicknesses less than 20 angstroms, the combination of Buchanan or Lin with Hodges does not teach the limitations of claim 6. In particular, Lin specifically teaches the ONO layer to include silicon oxynitride instead of an oxide-nitride gate dielectric as recited in claim 6. Similarly, Buchanan teaches gate dielectric 20 including oxynitride film layer 22. Such oxynitride films are distinct from the claimed oxide-nitride gate dielectric in which separate oxide and nitride layers are formed adjacent to each other. Consequently, the capacitance of the oxide-nitride gate dielectric disclosed in Hodges cannot be defined by the teachings within Buchanan or Lin. Accordingly, there is no motivation to combine the teachings of Buchanan or Lin with Hodges to teach the limitations of presently claimed

case. Freiberger does not mention the capacitance of interpoly dielectric 37 and, therefore, cannot be combined with Hodges to teach the limitations of claim 6 either.

For at least the reasons cited above, claim 6 is asserted to be patentably distinct over Hodges, Buchanan, Lin and Freiberger. Although claim 6 was not rejected in light of Shue, Krusell or Tremont, it is asserted that claim 6 is patentably distinct over those references as well. In particular, neither Shue, Krusell nor Tremont teach or suggest a semiconductor device with an oxide-nitride gate dielectric having substantially similar gate to substrate capacitance as an oxide gate dielectric comprising a thickness less than approximately 20 angstroms. As such, independent claim 6 is asserted to be patentably distinct over the cited art.

None of the cited art teaches or suggests growing an oxide film in the presence of an ozonated substance and depositing a silicon nitride film upon and in contact with the oxide film. Claim 12 recites: "[a] method for processing a semiconductor topography, comprising: growing an oxide film upon the semiconductor topography in the presence of an ozonated substance and depositing a silicon nitride film upon and in contact with the oxide film." Although Shue discloses a topography in which silicon nitride is arranged above silicon oxide, Shue fails to teach or suggest a method of forming such a topography by growing a silicon oxide film in the presence of an ozonated substance and depositing silicon nitride thereon. On the contrary, Shue teaches forming silicon nitride layer 14 upon silicon layer 12 and then thermally oxidizing the silicon nitride layer to form layer 18. Consequently, Shue fails to teach or suggest the limitations of claim 12.

Furthermore, the deficiencies within Shue cannot be overcome by the teachings of Krusell or Tremont. In particular, Krusell fails to teach or suggest growing a silicon dioxide film in the presence of an ozonated substance. Rather, Krusell specifically teaches depositing a silicon dioxide layer using a nitrogen-containing precursor, such as hexamethyl disilazane, as a source of silicon and an ozonated substance as a source of oxygen. Tremont, on the other hand, does teach growing oxide 64 and depositing silicon nitride 66 thereon. Oxide 64, however, is not grown in the presence of an ozonated substance as recited in claim 12. Tremont does teach rinsing the topography in the presence of an ozonated substance, but such a process only, if at all, provides a thin oxide layer of a few monolayers. Such an oxide film thickness is not sufficient to serve as oxide 64, which Tremont teaches having a thickness between 100 angstroms and 400 angstroms. Consequently, there is no motivation within Tremont to deposit a silicon nitride layer upon an oxide layer grown within the presence of an ozone substance. Accordingly, it is asserted that Shue, Krusell and Tremont,

whether taken separately or in combination, do not teach, suggest or provide motivation to teach the limitations of claim 12.

For at least the reasons cited above, claim 12 is asserted to be patentably distinct over Shue, Krusell and Tremont. Although claim 12 was not rejected in light of Hodges, Buchanan, Lin or Freiberger, it is asserted that claim 12 is patentably distinct over those references as well. In particular, neither Hodges, Buchanan, Lin nor Freiberger teach or suggest growing an oxide film in the presence of an ozonated substance. As such, independent claim 12 is asserted to be patentably distinct over the cited art.

None of the cited art teaches or suggests transferring a semiconductor topography at a temperature which is substantially similar to a temperature at which an oxide film is grown upon the topography. Claim 19 recites in part: "[a] method for forming an oxide-nitride stack, comprising: growing an oxide film in a first chamber at a first temperature; transferring the semiconductor topography from said first chamber to a second chamber, wherein said transferring comprises exposing the semiconductor topography to a substantially similar temperature as said first temperature ..." None of the cited art teaches or suggests a method with such a limitation. In fact, Shue, Krusell, Tremont, Hodges, Freiberger, Buchanan and Lin do not appear to even mention transferring a topography between chambers for processing. Without any teaching or suggestion of transferring a topography between processes, much less transferring a topography at a temperature which is similar to a process temperature used to grow an oxide film upon the topography, there is no motivation within the cited art to teach the limitations of claim 19. Accordingly, independent claim 19 is asserted to be patentably distinct over the cited art.

Although Krusell discloses atmospheric pressure reactor 250 in Fig. 2 as having multiple process chambers (i.e., reaction chambers 292, 294 and 296), Krusell fails to teach using the process chambers for sequential processing of a wafer. On the contrary, it appears that reaction chambers 292, 294, and 296 are all used to deposit silicon dioxide in the same manner such that multiple wafers may be processed simultaneously. In particular, Krusell specifically teaches the interiors of "... second and third reaction chambers 294 and 296 are substantially identical [to first reaction chamber 292]." (Krusell, column 4, lines 1-2.)

For at least the reasons stated above, Applicants assert that independent claims 6, 12, and 19, as well as claims dependent therefrom, are patentably distinct over the cited art. Accordingly, Applicants request removal of this rejection.

Patentability of the Added Claims:

The present Amendment adds claims 26-30. As will be set forth in more detail below, claims 26-30 are patentably distinct over the cited art.

None of the cited art teaches or suggests growing an oxide film in the presence of an ozonated substance comprising an ozone concentration between approximately 1 ppm and approximately 50 ppm. Added claim 26 recites: [a] method for processing a semiconductor topography, comprising: growing an oxide film upon the semiconductor topography in the presence of an ozonated substance comprising an ozone concentration between approximately 1 ppm and approximately 50 ppm ..." Support for such a limitation may be found, for example, on page 14, lines 18-19 of the Specification, "[i]n some embodiments, the ozonated substance may include an ozone concentration between approximately 1 ppm and approximately 50 ppm." As noted above, there is no teaching, suggestion or motivation within Shue, Krusell or Tremont to grow an oxide film in the presence of an ozonated substance and deposit a silicon nitride film thereon. In addition, neither Hodges, Buchanan, Lin nor Freiberger teach or suggest growing an oxide film in the presence of an ozonated substance. As such, there is no teaching, suggestion or motivation within the cited art to grow an oxide film in the presence of an ozonated substance comprising an ozone concentration between approximately 1 ppm and approximately 50 ppm and deposit a nitride layer thereon as recited in claim 26.

For at least the reasons set forth above, Applicants assert that independent claim 26 and claims dependent therefrom are asserted to be patentably distinct over the cited art. Accordingly, approval of added claims 26-30 is respectfully requested.

CONCLUSION

This response constitutes a complete response to all issues raised in the Office Action dated June 18, 2003. In view of the remarks traversing the rejections, Applicants assert that pending claims 6-30 are in condition for allowance. If the Examiner has any questions, comments, or suggestions, the undersigned attorney earnestly requests a telephone conference.

No fees are required for filing this amendment; however, the Commissioner is authorized to charge any additional fees, which may be required, or credit any overpayment, to Conley Rose, P.C. Deposit Account No. 03-2769/5298-08000.

Respectfully submitted,

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